Federal Democratic Republic of Ethiopia

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ET ISO 5269.3.DS (2012) (English): Pulps -- Preparation of laboratory sheets for physical testing, Part 3: Conventional and Rapid-Kothen sheet formers using a lcosed water system

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ETHIOPIAN STANDARD

ES ISO 5269-3:2012

First edition

Pulps — Preparation of laboratory sheets for physical testing —

Part 3:

Conventional and Rapid-Köthen sheet formers using a closed water system

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Foreword

This Ethiopian Standard has been prepared under the direction of the Technical Committee for paper and pulp Products (TC 3) and published by the Ethiopian Standards Agency (ESA).

The standard is identical with ISO 5269-3:2008 Pulps — Preparation of laboratory sheets for physical testing — Part 3: Conventional and Rapid-Köthen sheet formers using a closed water system published 2008(E).

For the purpose of this Ethiopian Standard, the adopted text shall be modified as follows.

- The phrase “International Standard” shall be read as “Ethiopian Standard”; and
- A full stop (.) shall substitute comma (,) as decimal marker.

ETHIOPIAN STANDARD **ES ISO 5269-3:2012**

Pulps — Preparation of laboratory sheets for physical testing —

Part 3:
Conventional and Rapid-Köthen sheet formers using a closed water system

1 Scope

This part of ISO 5269 specifies two procedures for preparing a closed water system which is in retention equilibrium, to be used for the preparation of laboratory sheets from pulps with a high fines content. One procedure is applicable to the preparation of laboratory sheets using the conventional sheet former and the other using the Rapid-Köthen sheet former. The sheets prepared prior to attaining retention equilibrium are discarded.

This part of ISO 5269 is especially applicable to mechanical and chemimechanical pulps, as well as to pulps prepared from recycled fibres, i.e. pulps with a high fines content for which retention of fines is poor when using the open water system as described in ISO 5269-1 or ISO 5269-2. This part of ISO 5269 is not applicable to some very long-fibred pulps, such as those from unshortened cotton, flax and similar materials.

After retention equilibrium is attained, the preparation of laboratory sheets for testing the physical properties follows the procedures described in ISO 5269-1 (conventional sheet former) or ISO 5269-2 (Rapid-Köthen sheet former), whichever is relevant.

This part of ISO 5269 is generally not applicable for the preparation of laboratory sheets from chemical pulps for which ISO 5269-1 or ISO 5269-2 are used.

This part of ISO 5269 is not applicable for the preparation of laboratory sheets for measuring ISO brightness. These sheets can be prepared in accordance with ISO 3688[3].

NOTE The procedures for forming, pressing and drying are different when using the conventional sheet former ar Rapid-Köthen sheet former, see Annex A.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5263-1, *Pulps — Laboratory wet disintegration — Part 1: Disintegration of chemical pulps*

ISO 5263-2, *Pulps — Laboratory wet disintegration — Part 2: Disintegration of mechanical pulps at 20 °C*

ISO 5263-3, *Pulps — Laboratory wet disintegration — Part 3: Disintegration of mechanical pulps at W 85 °C*

ISO 5269-1:2005, *Pulps — Preparation of laboratory sheets for physical testing — Part 1: Conventional sheet-former method*

ISO 5269-2:2004, *Pulps — Preparation of laboratory sheets for physical testing — Part 2: Rapid-Köthen method*

3 Principle

White water at retention equilibrium is produced by preparing laboratory sheets of defined grammage using a closed water system.

This white water is then used to prepare the sheets which will be used for physical testing, in either the conventional sheet former or the Rapid-Köthen sheet former.

NOTE The physical properties of sheets made in accordance with this International Standard using a closed water system in retention equilibrium will differ, in general, from the properties of sheets made in accordance with ISO 5269-1 or ISO 5269-2 using an open water system.

4 Apparatus

Use either a conventional sheet former or a Rapid-Köthen sheet former.

4.1 Conventional sheet former.

All the items described in 4.1 to 4.10 in ISO 5269-1:2005, and the following.

4.1.1 Circulating water system for the conventional sheet former, consisting of a reservoir placed under the drainage vessel to collect the circulating water and a pumping system which allows the sheet former to be filled from below the wire and also from above the wire. The water in the closed water system shall be in motion to avoid sedimentation of the fines. All parts of the system that come into contact with the water shall be of a non-corrosive material (plastic or stainless steel).

4.2 Rapid-Köthen sheet former.

All the items described in 4.1 to 4.2.6 in ISO 5269-2:2004, and the following.

4.2.1 Circulating water system for the Rapid-Köthen sheet former, consisting of a water reservoir, facilities to recirculate the water and a pumping system which allows the sheet former to be filled from above the wire. The water in the closed water reservoir shall be in motion to avoid sedimentation of the fines. All parts of the system that come into contact with the water shall be of a non-corrosive material (plastic or stainless steel).

5 Preparation of sample

5.1 Disintegration

Disintegrate mechanical and chemimechanical pulps in accordance with ISO 5263-2 or ISO 5263-3, whichever is relevant. ISO 5263-3 shall be used if the pulp exhibits latency. Disintegrate pulps made from recycled fibres in accordance with ISO 5263-2.

Some chemical pulps, e.g. straw pulps, can have a high fines content. If, for that reason, this part of ISO 5269 is to be used, disintegrate the chemical pulp in accordance with ISO 5263-1.

For slush pulp taken from mill streams, follow the instructions of the relevant part of ISO 5263.

5.2 Dilution

Dilute the stock with water to a mass fraction of between 0,2 % and 0,5 %. Use the stock for forming sheets with a minimum of delay.

It is recommended to use a mass fraction between 0,2 % and 0,3 % for stocks that tend to produce flocs.

NOTE Within the limits of normal tap water, the quality of the water used does not have any influence on the physical properties of the laboratory sheets prepared.

6 Procedure for the conventional sheet former

6.1 Preparation of white water in retention equilibrium

For sheets to be used for testing the general physical properties, the grammage is 60,0 g/m^2 ± 2,0 g/m^2 on an oven-dry basis. If sheets are to be used for tests requiring another grammage, sheets shall be made to the required grammage to an accuracy of ± 3 %.

Close the water system and fill the water reservoir with tap water at room temperature, 20 °C ± 5 °C. Use the closed water system and the stock prepared in 5.2. When preparing the sheets, fill the lower section of the sheet former from the bottom with water up to the wire screen. Then fill from the top and, before the water level arrives at the mark located (350 ± 1) mm above the wire screen, add the required amount of the stock. Prepare at least 10 laboratory sheets having a nominal grammage of 60, 0 g/m^2 to attain a closed water system in a state of retention equilibrium (the retention of fines). Check that the state of equilibrium is attained by weighing the dried sheets. During the build-up of the white water to retention equilibrium, the mass of the sheets increases. When the oven-dry mass of the sheets remains constant even when additional sheets are prepared, the retention equilibrium is attained. Reject the laboratory sheets prepared to attain the retention equilibrium.

If sheets of a grammage of 60 g/m^2 are required, from the mass of the last sheet, either determine the amount of stock which will produce a laboratory sheet of this oven-dry grammage, or adjust the stock concentration so that a sheet of this oven-dry grammage can be produced using a vessel of known fixed volume. Prepare the sheets in accordance with 6.2.

If sheets of a higher grammage are required, using the white water prepared above, prepare further sheets at the higher grammage until the new retention equilibrium is achieved. From the mass of the last sheet, determine the amount of stock required or adjust the stock concentration as above. Prepare the sheets in accordance with 6.2.

NOTE On a conditioned basis, the grammage of laboratory sheets having a grammage of 60 g/m^2 is approximate 65 g/m^2.

6.2 Preparation of laboratory sheets for physical testing

With the exception that the sheet former shall be filled from the bottom up to the wire screen level, and from the top from the screen up to the 350 mm mark, using the white water prepared in 6.1, use the procedure described in ISO 5269-1 and prepare laboratory sheets of the required grammage for physical testing.

Before testing, condition the laboratory sheets in accordance with ISO 187[1]. The testing should be performed in accordance with ISO 5270[4].

7 Procedure for the Rapid-Köthen sheet former

7.1 Preparation of white water in retention equilibrium

For sheets to be used for testing the general physical properties, the grammage is 75 g/m^2 ± 2 g/m^2 on an oven-dry basis. If sheets are to be used for tests requiring another grammage, the grammage is 140 g/m^2 ± 4 g/m^2, calculated on an oven-dry basis.

Close the outlet and fill the closed water reservoir with tap water at room temperature, 20 °C ± 5 °C. Start the recirculation pump. Use the closed water system and the stock prepared in 5.2 and start to prepare sheets. The sheet former is always filled from the top. Prepare at least eight laboratory sheets having a nominal grammage of 75 g/m^2 to attain a closed water system in a state of retention equilibrium (the retention of fines). Check that the state of equilibrium is attained by weighing the dried sheets. During the build-up of the white water to retention equilibrium, the mass of the sheets increases. When the oven-dry mass of the sheets remains constant even when additional sheets are prepared, the retention equilibrium is attained. Reject the laboratory sheets prepared to attain the retention equilibrium.

If sheets of a grammage of 75 g/m^2 are required, from the mass of the last sheet, either determine the amount of stock which will produce a laboratory sheet of this oven-dry grammage, or adjust the stock concentration so that a sheet of this oven-dry grammage can be produced using a vessel of known fixed volume. Prepare the sheets in accordance with 7.2.

If sheets of the higher grammage (140 g/m^2) are required, using the white water prepared above, prepare further sheets at the higher grammage until the new retention equilibrium is achieved. From the mass of the last sheet, determine the amount of stock required or adjust the stock concentration as above. Prepare the sheets in accordance with 7.2.

NOTE On a conditioned basis, the grammage of laboratory sheets having the required grammage 75 g/m^2 is approximately 81 g/m^2 and the required grammage 140 g/m^2 of laboratory sheets for board-related properties is approximately 150 g/m^2.

In the Rapid-Köthen sheet former, the temperature of the closed water can be controlled and adjusted to between 20 °C and 80 °C. If the standard temperature, 20 °C ± 5 °C, is not used, the temperature should be reported.

7.2 Preparation of laboratory sheets for physical testing

Using the white water prepared in 7.1 and the procedure described in ISO 5269-2, prepare laboratory sheets for physical testing having the required grammage, by filling the sheet former with white water from the top.

Before testing, condition the laboratory sheets in accordance with ISO 187[1]. The testing should be performed in accordance with ISO 5270[4].

8 Test report

The test report, accompanying the laboratory sheets, shall include the following information:

a) a reference to this part of ISO 5269;

b) the sheet former used (conventional sheet former or Rapid-Köthen sheet former);

c) date and place of sheet preparation;

d) all the information necessary for complete identification of the sample;

e) the disintegration procedure used in the laboratory;

f) the target grammage of the sheets;

g) if it is not as stated in 7.1, the temperature of the tap water (only for the Rapid-Köthen sheet former);

h) any unusual features observed in the course of the test;

i) any operations not specified in this part of ISO 5269, or that are regarded as optional, which might affect the results when the laboratory sheets are tested.

Annex A
(informative)

Differences between conventional and Rapid-Köthen sheet preparation

The following differences have been identified between the conventional sheet former and the Rapid-Köthen sheet former, see ISO 5269-1 and ISO 5269-2 respectively:

Table A.1 — Differences between conventional and Rapid-Köthen sheet preparation

Procedures	Conventional sheet former	Rapid-Köthen sheet former
Grammage, standard testing, g/m^2	60,0 ± 2,0 [a]	75 ± 2 [b]
Grammage, board-related properties, g/m^2	required grammage ± 3 % [a]	140 ± 4 [b]
Shape of the sheet	Circular, square or rectangular	Circular
Wire: nominal size of aperture	125 µm (see ISO 3310-1:2000)	—
Wire: number of warp/weft	—	60/55 wires/cm
Wire: wire diameter	90 µm (77 µm − 104 µm)	(0,060 − 0,065) mm
Establishing a white water system: number of sheets to be prepared	10 build-up sheets When constant mass of the sheets is obtained, start to prepare sheets for testing.	8 build-up sheets When constant mass of the sheets is obtained, start to prepare sheets for testing.
Filling the sheet former	From the bottom up to the wire screen, then from the top up to the 350 mm mark.	Always from the top.
Agitation system	Stirrer (6 + 1 times) or air agitator	Compressed air: 5 s.
Dewatering and suction	Dewatering: 10 s after ended agitation. Suction after water has left the wire screen: > 5 s.	Suction after water has left the wire screen: 10 s.
Couching	Couch plate, 20 s or couching system, 5 s to 30 s or couch roll, 5 complete rolls.	Couch roll (3 kg), back and forth over a 2 s period.
Pressing	First press: 410 kPa, 5 min. Second press: 410 kPa, 2 min.	Drying under suction: 96 kPa for 5 min to 7 min or > 12 min, see Drying and Conditioning.
Drying of sheets	From wet sheets to equilibrium with the conditioning atmosphere in ISO 187.	Standard: 5 min to 7 min, at 93 °C High grammage: > 12 min at 93 °C
Conditioning	ISO 187	From dry sheets to equilibrium with the conditioning atmosphere in ISO 187.
Physical properties, general	higher strain at break lower strength properties	lower strain at break higher strength properties

[a] As stated in ISO 5269-1.

[b] As stated in ISO 5269-2.

Bibliography

[1] ISO 187, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*

[2] ISO 3310-1:2000, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

[3] ISO 3688, *Pulps — Preparation of laboratory sheets for the measurement of diffuse blue reflectance factor (ISO brightness)*

[4] ISO 5270, *Pulps — Laboratory sheets — Determination of physical properties*

[5] MOHLIN, ULLA-BRITT; Mechanical pulp properties — the importance of fines retention. *Svensk Papperstidning* **80** (1977): 3, pp. 84-88

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Ethiopian Standards Agency

Organization and Objectives

The Ethiopian Standards Agency (ESA) is the national standards body of Ethiopia established in 2010 based on regulation No. 193/2010.ESA is established due to the restructuring of Quality and Standards Authority of Ethiopia (QSAE) which was established in 1970.

ESA's objectives are:-

- Develop Ethiopian standards and establish a system that enable to check weather goods and services are in compliance with the required standards,
- Facilitate the country's technology transfer through the use of standards,
- Develop national standards for local products and services so as to make them competitive in the international market.

Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational Institutions, research institutes, government organizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/ or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes.
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ESA, representing Ethiopia, is a member of the International Organization for Standardization (ISO), and Codex Alimentarius Commission (CODEX). It also maintains close working relations with the international Electro-technical Commission (IEC) and American Society for Testing and Materials (ASTM).It is a founding member of the African Regional Organization for standardization (ARSO).

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